Tetanus

(Also known as Lockjaw)

Report Immediately

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1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Tetanus is caused by a potent exotoxin produced by *Clostridium tetani,* a spore-forming, anaerobic, gram-positive bacillus.

B. Clinical Description

Generalized tetanus is an acute, often fatal neurologic disease characterized by painful skeletal muscular contractions. The toxin blocks signals through nerves that signal muscles not to contract in response to voluntary contractions of opposing muscles. Onset is gradual, occurring over 1 to 7 days. The muscle stiffness usually first involves the jaw (lockjaw) and neck and progresses to severe generalized muscle spasms, which frequently are aggravated by any external stimulus. Severe spasms persist for one week or more and subside over a period of weeks in those who recover. *Clostridium tetani* is a non-invasive wound contaminant; it causes neither tissue destruction nor an inflammatory response.

Neonatal tetanus, which arises from contamination of the umbilical stump, is a form of generalized tetanus. However, inability to nurse is the most common presenting sign. Localized tetanus is manifested by local muscle spasms in areas contiguous to a wound, although history of an injury or an apparent portal of entry may be lacking. Cephalic tetanus is a rare form of the disease and involves the cranial nerves, especially the facial area. It is associated with infected wounds of the head and neck, including otitis media. Both localized and cephalic tetanus may precede generalized tetanus.

Complications of the disease include laryngospasm (spasm of the vocal cords) and/or spasm of the muscles of respiration, leading to interference with breathing; fractures of the spine or long bones, which may result from sustained contractions and convulsions; and hyperactivity of the autonomic nervous system, which may lead to hypertension and/or an abnormal heart rhythm. Other complications may include increased susceptibility to nosocomial infections, pulmonary embolism (particularly in drug addicts and elderly patients), and aspiration pneumonia. The case-fatality rate ranges from 10% to 90%; it is highest in infants and the elderly and varies inversely with the length of the incubation period and the availability of experienced intensive care unit personnel and resources.

Tetanus disease does not confer immunity. Patients who survive the disease should be given a complete series of vaccine.

C. Reservoirs

Clostridium tetani is a normal inhabitant of soil and of animal and human intestines. It is ubiquitous in the environment, especially where contamination by excreta is frequent.

D. Modes of Transmission

There is **no** person-to-person transmission of tetanus. Wounds, recognized or unrecognized, are the sites at which the organism enters, multiplies, and produces toxin. Cases of tetanus have followed injuries considered too trivial for medical consultation.

E. Incubation Period

The incubation period ranges from 2 days to months, with most cases occurring within 14 days. In neonates the incubation period is usually 5 to 14 days. In general, shorter incubation periods are associated with more heavily contaminated wounds, more severe disease, and a worse prognosis.

F. Period of Communicability or Infectious Period

There is no infectious period as tetanus in not transmitted person-to-person. Tetanus is the only vaccine-preventable disease that is not contagious.

G. Epidemiology

Tetanus occurs worldwide and is more frequent in warmer climates and months, partly because of the frequency of contaminated wounds. Despite the availability of tetanus toxoid (TT), tetanus continues to cause a substantial health impact in the world. In 1997, neonatal tetanus alone accounted for an estimated 277,400 deaths worldwide. Tetanus is sporadic and relatively uncommon in the United States and most industrial countries, mostly because of widespread use of tetanus toxoid as part of routine immunizations and improved wound management. Since the mid-1970s, 50–100 cases of tetanus have been reported annually in the US. Almost all reported cases have occurred in individuals who had never been vaccinated or who completed a primary series but had not had a booster dose in the preceding 10 years. Ninety percent of cases who were seen acutely did **not** receive the appropriate treatment. From 1982 through 1992, two-thirds of US tetanus cases occurred in persons 50 years of age or older. Serosurveys show that 20–70% of US adults are susceptible to tetanus (and susceptibility increases with age). Neonatal tetanus is rare in the US, with only two cases reported between 1989 and 1998. Neither of the infants' mothers had ever received tetanus toxoid.

Heroin users, particularly those who inject themselves subcutaneously with quinine-cut heroin, appear to be at high risk for tetanus. Quinine is used to dilute heroin and may actually favor growth of *C. tetani*.

During 1995–97, acute injuries such as punctures, lacerations, and abrasions accounted for 64% of reported cases of tetanus in the US. Approximately one-third of all reported cases were not due to acute injury, and some had no known injury at all. Today, tetanus in the US affects primarily older adults. The last reported case of neonatal tetanus in the US occurred in 1998 in Montana in a newborn whose umbilical stump had been treated with a nonsterile clay. The last reported case of tetanus in Massachusetts was in 1996 in a 38-year-old housepainter whose last dose of tetanus-containing toxoid was more than ten years previous to his infection via a puncture wound to the foot.

2) REPORTING CRITERIA AND LABORATORY TESTING SERVICES

A. What to Report to the Massachusetts Department of Public Health

- A suspect or confirmed case of tetanus, as diagnosed by a healthcare professional.

Note: See Section 3 below for information on how to report a case.

B. Laboratory Testing Services Available

There are no laboratory findings characteristic of tetanus, and the diagnosis does not depend on bacteriologic confirmation. The diagnosis is entirely clinical by excluding other possibilities, including hypocalcemic tetany, phenothiazine reaction, strychnine poisoning, and hysteria. *Clostridium tetani* is recovered from the wound in

only 30% of cases, and not infrequently, it is isolated from patients who do not have tetanus. Sera collected before TIG is administered can demonstrate susceptibility of a patient to the disease, but the test is not readily available.

3) DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To assure early evaluation and, where appropriate, treatment with tetanus-diphtheria toxoid (Td) and/or tetanus immune globulin (TIG) and hospitalization.
- To identify groups and areas in which risk of disease is highest (due to under-immunization, occupation, other practices, etc.) so that prevention efforts can be focused.

B. Laboratory and Healthcare Provider Reporting Requirements

Refer to the lists of reportable diseases (at the end of this manual's Introduction) for information.

Note: Due to the potential severity of tetanus, the Massachusetts Department of Public Health (MDPH) requests that information about any case be **immediately reported** to the MDPH Division of Epidemiology and Immunization by calling (617) 983-6800 (weekdays) or (617) 983-6200 (nights/weekends).

C. Local Board of Health Reporting and Follow-Up Responsibilities

MDPH regulations (*105 CMR 300*) stipulate that each local board of health (LBOH) must report the occurrence of any case of tetanus (as defined by the reporting criteria in Section 2A). MDPH requests that information about any suspect or known case of tetanus be **immediately reported** to the MDPH Division of Epidemiology and Immunization by calling (617) 983-6800 (weekdays) or (617) 983-6200 (nights/weekends).

Note: Due to national surveillance and reporting requirements, the Massachusetts Immunization Program (MIP) takes the lead on tetanus case investigation (including filling out the official case report form) and case management recommendations, in collaboration with the local board of health. MIP will keep the local board of health informed of all significant developments and will request the assistance of the board of health as needed.

D. Initial Questions to Ask Healthcare Provider and Patient

In order to assess the likelihood that a suspect case is a true case, MIP and/or other public health staff helping in the investigation should ask about: 1) symptoms, 2) tetanus immunization history, 3) recent history of a wound, and 4) occupations or hobbies involving contact with soil or manure.

4) WOUND AND CASE MANAGEMENT

This section provides detailed recommendations. LBOHs should familiarize themselves with the information. However, the Massachusetts Immunization Program will take the lead on implementing these measures, in collaboration with the board of health.

A. Isolation and Quarantine Requirements (*105 CMR 300.200*)

None.

B. Protection of Contacts of a Case

There is no immunization or prophylaxis necessary for contacts of a case. If the patient is hospitalized, standard precautions should be used.

C. Tetanus Prophylaxis in Routine Wound Management

Appropriate immunization is central to tetanus prophylaxis. The need for active immunization (with tetanus-diphtheria toxoid, Td) and/or passive immunization (with TIG) depends on the condition of the wound and the patient's immunization history:

	Clean, minor wounds		All other wounds[1]	
Vaccination History	**Td[2]**	**TIG**	**Td[2]**	**TIG**
Unknown or < 3 doses	Yes	No	Yes	Yes
≥ 3 doses	No[3]	No	No[4]	No, but yes if HIV-infected[5]

[1] Such as, but not limited to, wounds contaminated with dirt, feces, soil, and saliva; puncture wounds; avulsions; and wounds resulting from missiles, crushing, burns, and frostbite.
[2] Use DTaP or DT for children < 7 years of age.
[3] Yes, if > 10 years since last dose.
[4] Yes, if > 5 years since last dose.
[5] Yes, if HIV-infected, regardless of immunization history.

Regardless of immunization status, dirty wounds should be properly cleaned and debrided if dirt and/or necrotic tissue are present. Wounds should receive prompt surgical treatment to remove all devitalized tissue and foreign material as an essential part of tetanus prophylaxis. It is **not** necessary or appropriate to extensively debride puncture wounds.

Case Management

- Tetanus immune globulin (TIG, human) is recommended for treatment. A single dose of 3,000 to 6,000 U is recommended for children and adults. (*Note:* the optimum therapeutic dose has not been established.) Doses as small as 500 U have been demonstrated to be effective for neonatal tetanus. The preparation available in the US must be given intramuscularly. Some authorities believe that part of the dose should infiltrate locally around the wound, although the efficacy of this approach has not been proven.
- Intravenous immune globulin (IGIV) contains antibodies to tetanus and may be considered for treatment if TIG is not available. However, approval by the Food and Drug Administration has not been given for this use and the dosage has not been determined.
- All wounds should be properly cleaned and debrided, especially if extensive necrosis is present. In neonatal tetanus, wide excision of the umbilical cord is **not** indicated.
- **Supportive care and pharmacotherapy to control spasms are of major importance.**
- Oral (or intravenous) metronidazole (30 mg/kg per day, given at 6-hour intervals) is the drug of choice and is effective in reducing the number of vegetative forms of *Clostridium tetani*. Parenteral penicillin G (100,000 U/kg per day, given at 4- to 6-hour intervals) is an alternative treatment. Therapy for 10 to 14 days is recommended.
- Because disease does not confer immunity, administer Td (or for children < 7 years, DTaP, DT) if this was not done during wound management.

D. Preventive Measures

Personal Preventive Measures/Education

Vaccination, including routine childhood vaccination and Td boosters beginning at age 11–12 years and continuing every 10 years thereafter, is the best preventive measure against tetanus. Diphtheria-containing formulations should always be used. The Advisory Committee on Immunization Practices (ACIP) recommends that all children receive a routine series of five doses of tetanus- and diphtheria-containing vaccine at ages 2, 4, 6, 15–18 months, and 4–6 years. Booster doses of diphtheria and tetanus toxoids should then be administered beginning at age 11–12 years (provided at least 5 years have passed since the last dose) and every 10 years

thereafter. DTaP and DT should be used in persons < 7 years of age, whereas Td is the preferred preparation for persons ≥ 7 years of age. The Td catch-up schedule for those starting immunization at ≥ 7 years of age consists of 3 doses. The second dose is usually given 1–2 months after the first dose, and the third dose 6 months after the second dose.

Healthcare providers and the public must be educated on the necessity of primary immunization with tetanus-diphtheria toxoid and 10-year booster doses, the hazards of puncture wounds and closed injuries, and the potential need after injury for active and/or passive prophylaxis. Because tetanus is preventable, each case should be considered a failure to vaccinate and should be used as a means of determining how to prevent further failures from occurring. Surveillance information should be used to raise awareness of the importance of immunization and to characterize persons or places in which additional efforts are required to raise immunization levels and decrease disease incidence.

For the prevention of neonatal tetanus, preventive measures (in addition to maternal immunization) include community immunization programs for adolescent girls and women of childbearing age and appropriate training of midwives in recommendations for immunization and sterile technique.

Please refer to the *MMWR* Surveillance Summary on Tetanus, July 3, 1998 (listed under References, below) and the most current versions of MDPH's *Immunization Guidelines* and *Massachusetts Immunization Program-Supplied Vaccines and Patient Eligibility Criteria* for details about DTaP/DT/Td vaccination, the recommended schedule, who should and shouldn't get the vaccine, and who is eligible to receive state-supplied vaccine. These as well as other relevant resources are available through the Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850.

Environmental Measures
Sterilization of hospital supplies will prevent the infrequent instances of tetanus that may occur in a hospital from contaminated sutures, instruments, or plaster casts.

ADDITIONAL INFORMATION

The following is the formal Centers for Disease Control and Prevention (CDC) surveillance case definition for tetanus. It is provided for your information only, it is not necessary to use this information for reporting or investigating a case. (CDC case definitions are used by the state health department and CDC to maintain uniform standards for national reporting.) For reporting to the MDPH, always use the criteria outlined in Section 2) A of this chapter.

Case Definition for Tetanus (as defined by CDC, 1999)
Clinical case definition
Acute onset of hypertonia and/or painful muscular contractions (usually of the muscles of the jaw and neck) and generalized muscle spasms without other apparent medical cause.

Case classification
Confirmed: a clinically compatible case, as reported by a healthcare professional.

REFERENCES

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CDC. *Manual for the Surveillance of Vaccine-Preventable Diseases*. CDC, September 1999.

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Chin, J., ed. *Control of Communicable Diseases in Man, 17th Edition.* Washington, DC, American Public Health Association, 2000.

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